

PATENT ABSTRACTS OF JAPAN

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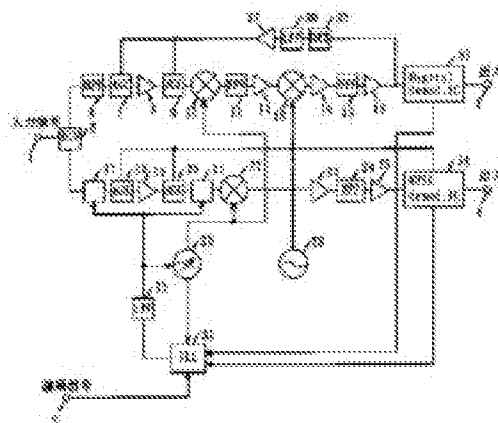
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(54) RECEIVER

(57)Abstract:

PURPOSE: To receive both an NTSC signal and a high definition television signal by processing the NTSC signal with the single superheterodyne system and processing the high definition television signal with the double superheterodyne system.

CONSTITUTION: A local oscillator 26 and a PLL circuit 31 are used in common, in the fine adjustment using an AFC voltage, the AFC voltage from a high definition television signal demodulator 33 and an NTSC signal AM demodulator 34 in the circuit 31 is selected in response to a reception signal to control an oscillated frequency from the oscillator 26. Thus, the reception of an NTSC signal and a high definition television signal are received and the high definition television signal is demodulated with high accuracy. Furthermore, the high definition television signal processing section and the NTSC signal processing section use the local oscillator and the PLL circuit in common to reduce the circuit scale and a simple channel selection means in which the frequency control is implemented by the oscillator 26 only is obtained.



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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] In a receiving set which an RF signal modulated by standard television signals (NTSC, PAL, SECAM, etc.) and an RF signal modulated by a high-definition TV JON signal are inputted, and restores to it and outputs each signal, The 1st local oscillator that performs oscillated frequency control for a high-definition TV JON signal processing part which processes this high-definition TV JON signal by which AM was carried out at least using a PLL circuit by channel selection information, The 1st frequency converter that changes a desired signal into the 1st IF signal, and the 2nd local oscillator, It is considered as a double superheterodyne system which comprises the 2nd frequency converter changed into the 2nd IF signal, and a demodulator which input the 2nd IF signal, and to which it restores, A local oscillator which performs oscillated frequency control for a standard television signal treating part which processes this standard television signal by which AM was carried out at least using a PLL circuit by channel selection information, A receiving set constituting from a single superheterodyne system which comprises a frequency converter which changes a desired signal into an IF signal, and a demodulator which input an IF signal, and to which it restores.

[Claim 2] A wave detector which detects the 2nd IF signal of a high-definition TV JON signal for AGC voltage of said high-definition TV JON signal processing part in the receiving set according to claim 1, A receiving set generating with a low pass filter which passes this detection output, and an amplifier which amplifies an output of this low pass filter to a desired pressure value.

[Claim 3]. In the receiving set according to claim 1 or 2, are contained in said high-definition TV JON signal processing part. . Are contained in the 1st local oscillator that performs oscillated frequency control using a PLL circuit, or said standard television signal treating part. One of PLL circuits and local oscillators of a local oscillator which perform oscillated frequency control using a PLL circuit are shared, A receiving set having composition which switches AFC voltage for high-definition TV JON signals outputted from a demodulator for high-definition TV JON, and AFC voltage for standard television signals outputted from a demodulator for standard television signals in said PLL circuit, and is used for frequency control.

[Claim 4]. In the receiving set according to claim 3, are contained in said high-definition TV JON signal processing part. A receiving set sharing one frequency converter of the frequency converters which change a desired signal into an IF signal contained in the 1st frequency converter that changes a desired signal into the 1st IF signal, or said standard television signal treating part.

[Claim 5] In Claim 1 or the receiving set according to claim 2, 3, or 4, The 3rd frequency

converter that inputs a local oscillation signal outputted from the 3rd local oscillator and this 3rd local oscillator, and said 2nd IF signal at said high-definition TV JON signal processing part, and is changed into a baseband signal, A receiving set forming a demodulator for high-definition TV JON signals of this baseband.

[Claim 6] A receiving set constituting the 3rd local oscillator from an oscillating circuit using a crystal oscillator, forming a counting-down circuit which carries out dividing of the local oscillation signal outputted from this 3rd local oscillator, and outputs it in the receiving set according to claim 5, and using this dividing signal as a reference signal of a PLL circuit.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is a receiving set which can receive a high-definition TV JON signal and the usual television signal, It is related with the receiving set which carries out common reception of the signal especially compressed into a 6-MHz zone as a high-definition TV JON signal, and the NTSC signal which has a 6-MHz zone as a usual television signal.

[0002]

[Description of the Prior Art] the Television Sub-Division broadcasting formats (NTSC, PAL, etc.) from recent years and the former -- in addition, establishment of the high-definition TV JON broadcasting format is advanced in each country. In connection with this, the receiving set with little image quality and tone quality degradation at the time of high-definition TV JON signal reception has been needed also in a receiving set. The conventional single superheterodyne system Television Sub-Division receiving set is shown in drawing 13. In the figure, 1 a signal input terminal and 2 a channel select signal input terminal and 4 An image and a voice signal output terminal, 17 and 21 -- variable tuning circuits, and 18 and 20 -- variable attenuator and 19 -- an RF amplifier and 22 -- as for a local oscillator and 29, an IF amplifier and 24 are [a PLL (phase locked loop) circuit and 34] AM demodulation machines a frequency converter, and 23 and 25 a low pass filter and 31 an IF filter and 26. The NTSC signal is used and explained to the standard television signal as an example after this.

[0003] By the NTSC signal inputted from the signal input terminal 1, among the RF signals by which AM was carried out a desired signal, It passes selectively in the variable tuning circuits 17 and 21 which follow the oscillating frequency of the local oscillator 26 and change the center frequency of the pass band, it amplifies or decreases suitably with the variable attenuators 18 and 20 and RF amplifier 19 so that a desired signal may serve as a desired receiving level, and it is inputted into the frequency converter 22. It mixes with the local oscillation signal from the local oscillator 26 which forms feedback by PLL circuit 31 and the low pass filter 29 so that it may oscillate on the frequency corresponding to a desired channel with the channel select signal inputted from the channel select signal input terminal 2 in the frequency converter 22, The IF signal of 45 MHz bands is outputted. An IF signal is amplified with the 1st and 2 IF amplifiers 23 and 25, and only a desired zone is passed by IF filter 24 which comprises an SAW filter etc., it gets over with the AM demodulation machine 34, and the image and audio signal of baseband are outputted. AGC is performed using the inside and the variable attenuators 18 and 20 of the AM demodulation machine 34. AFC carries out fine control of the oscillating frequency of the local oscillator 26, and performs it.

[0004]

[Problem(s) to be Solved by the Invention]However, the above-mentioned receiving set receives the usual television signals, such as NTSC, and reception of the high-definition TV JON signal is not taken into consideration. Receiving both usual television signals and high-definition TV JON signals is not taken into consideration, either.

[0005]Both the purposes of this invention can receive a usual television signal and high-definition TV JON signal. It is in providing the receiving set which can receive the NTSC signal which has a 6-MHz zone as a usual television signal especially, and the signal compressed into a 6-MHz zone as a high-definition TV JON signal.

[0006]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, in this invention, a single superheterodyne system performs NTSC signal processing, By a TERODAIN method, consider high-definition TV JON signal processing as composition to perform to a double supermarket which has the 1st and 2nd mixer, and to it about the double superheterodyne system. Set the 1st IF signal frequency as 1 GHz or more, and a band pass filter which has display flatness within a zone which does not degrade a recovery of a high-definition TV JON signal in the 1st IF filter, and a low group delay deviation is used, An SAW filter for high-definition TV JON signals was provided as the 2nd IF filter, and a demodulator for highly minute signals was formed as a demodulation section.

[0007]

[Function]In this invention, the receiving set which can receive an NTSC signal and a high-definition TV JON signal can be provided by the above-mentioned composition. By what a channel selection circuit, a local oscillator, and the 1st mixer are shared at the time of an NTSC signal and high-definition TV JON signal reception, and the 2nd IF filter or an IF filter, and a demodulator are individually formed for in an NTSC signal and high-definition TV JON signals. The receiving set which receives the NTSC signal which circuit structure reduced, and a high-definition TV JON signal can be constituted.

[0008]

[Example]Hereafter, Drawings explain working example of this invention.

[0009]Drawing 1 is a block diagram of the receiving set in which the 1st working example of this invention is shown.

[0010]In the figure, 1 a signal input terminal and 2 a channel select signal input terminal and 3 A high-definition TV JON signal output terminal, 4 the image for NTSC and a voice signal output terminal, and 5 a distributor and 6 An input filter, Variable attenuator, and 8 and 19 7, 9, 18, and 20 The 1st and 2nd RF amplifier, 10 the 1st mixer and 11 the 1st IF filter and 12 The 1st IF amplifier, 13 the 2nd mixer and 14 the 1st IF amplifier and 15 The IF filter for high-definition TV JON signals, 16 the 2nd IF amplifier, and 17 and 21 variable tuning circuits and 22 The 3rd mixer, 23 the 3rd IF amplifier and 24 the IF filter for NTSC signals, and 25 The 4th IF amplifier, 26 the 3rd local oscillator and 27 the 1st local oscillator and 28 The 2nd local oscillator, 29 and 30 -- as for the AM demodulation machine for NTSC signals, and 35, a PLL circuit and 33 are [a low pass filter and 37] AGC voltage amplifiers a low pass filter, and 31 and 32 the demodulator for high-definition TV JON signals, and 34 the signal level wave detector for high-definition TV JON signals, and 36. In the figure, the same number as drawing 13 is given to the portion which performs the same operation as Fig. 13, and explanation is abbreviated to it.

[0011]When an NTSC signal is inputted, since it is the same as signal processing described by the conventional example, explanation is omitted here. Input the RF signal of high-definition TV JON which has the 6-MHz zone which carried out the after [an A/D conversion] data

compression of the RF signal by which AM was carried out by the NTSC signal, and the HARASHIN item of high-definition TV JON, and was modulated by QAM (orthogonal-axis amplitude modulation) etc. from the signal input terminal 1, and the distributor 5 distributes, The input filter 6 divides the RF signal of this high-definition TV JON into a VHF band and a UHF band (a VHF band may be further divided into low-pass, a mid-range, and a high region.), and the zone containing a desired channel is passed selectively. To the desired channel, it amplifies or decreases suitably with the variable attenuators 7 and 9 and RF amplifier 8 so that it may be set to a desired signal level, and it inputs into the 1st mixer 10. In the 1st mixer 10. It mixes with the local oscillation signal from PLL circuit 32 which built in the reference oscillator and the counting-down circuit so that it might oscillate on the frequency corresponding to a desired channel with the channel select signal inputted from the channel select signal input terminal 2, and the local oscillator 27 which forms feedback by the low pass filter 30, The 1st IF signal is outputted. The 1st IF signal frequency is set up more than the upper limited frequency of the ground transmission band of an NTSC television signal, or a CATV transmission band in order to reduce the intermodulation interference of an input signal, etc. The mutual interference disturbance by the 1st local oscillation signal, the 2nd local oscillation signal, and its higher harmonic signal is also taken into consideration, and it is 1 GHz or more and, specifically, sets to 1.2 GHz bands, 1.7 GHz bands, 2.6 GHz bands, 3 GHz bands, etc. The 1st IF signal set as these frequency bands is selectively passed by 1st IF filter 11. The recovery of a high-definition TV JON signal needs a recovery higher-precision than an NTSC signal. In order not to degrade the demodulation characteristic of a high-definition TV JON signal, the band pass filter which has the display flatness within a zone and a low group delay deviation is used for the 1st IF filter. After amplifying the 1st IF signal with 1st IF amplifier 12, it is inputted into the 2nd mixer 13. In the 2nd mixer, it mixes with the local oscillation signal from the 2nd local oscillator 28, and the 2nd IF signal is outputted. Let the 2nd IF signal frequency be the same 45 MHz bands as the time of the present NTSC signal reception. It inputs into IF filter 15 for high-definition TV JON signals which comprises an SAW filter etc., after amplifying the 2nd IF signal with 1st IF amplifier 14. Only the zone of the reception channel of choice is passed by an IF filter. In receiving a high-definition TV JON signal, the reception channel of choice is amplified with 2nd IF amplifier 16, and it inputs into the demodulator 33 for high-definition TV JON signals, and the recovery according to a modulation method is performed and it outputs the high-definition TV JON signal by which the data compression was carried out from the output terminal 3. The outputted signal is inputted into the digital signal processing circuit which performs data decompression, D/A conversion, etc., and outputs an image and a sound, or data to high-definition TV JON. On the other hand, when receiving an NTSC signal, the reception channel of choice is amplified with 4th IF amplifier 25, and it inputs into the AM demodulation machine 34 for NTSC signals, and AM demodulation is carried out and the image and audio signal of baseband are outputted from the output terminal 4. AGC detects the signal which branched from the output of 2nd IF amplifier 16 with the signal level wave detector 35, when receiving a high-definition TV JON signal, with the low pass filter 36 and the AGC voltage amplifier 37, it generates AGC voltage, impresses it to the variable attenuators 7 and 9, and is performed. When receiving an NTSC signal, the part which ran short an inside and inside the AM demodulation machine 34 is performed using the variable attenuators 18 and 20. Using each AFC voltage from the demodulator 33 for high-definition TV JON signals, and the AM demodulation machine 34 for NTSC signals, AFC carries out fine control of the oscillating frequency of the 2nd local oscillator 28 and the 3rd local oscillator 26, and performs it. Although mentioned later, In order

to take into consideration the high-definition TV JON signal also when transmitted by the same channel as an NTSC signal, and to avoid the interference disturbance from an NTSC signal, Near [where the energy in an NTSC signal is high] an image and a sound carrier, and the chrominance subcarrier, It is required for using the signal shown in drawing 7 which does not arrange the spectrum of a high-definition TV JON signal beforehand, or the demodulator 33 for high-definition TV JON signals to provide the notch filter from which the subcarrier of the above-mentioned NTSC signal and a subcarrier are removed etc.

[0012]As explained above, reception of an NTSC signal and a high-definition TV JON signal is not only possible, but the receiving set of this example can be restored to a high-definition TV JON signal with high precision.

[0013]Drawing 2 is a block diagram of the receiving set in which the 2nd working example of this invention is shown. In the figure, the same number as drawing 1 is given to the portion which performs the same operation as Fig. 1, and explanation is abbreviated to it.

[0014]This example takes reduction of circuit structure into consideration. Namely, in the 1st working example of the above, the 3rd local oscillator 26 and PLL circuit 31 are used for high-definition TV JON signals the 1st local oscillator 27, PLL circuit 32, and for NTSC signals, Control the local oscillation signal frequency which changes the reception channel of choice into the 1st IF signal or an IF signal, and at the time of high-definition TV JON signal reception. The fine adjustment using AFC voltage to the 2nd local oscillator 28 having performed in this example. The local oscillator 26 and PLL circuit 31 are shared, the fine adjustment using AFC voltage also switches the AFC voltage from the demodulator 33 for high-definition TV JON signals, and the AM demodulation machine 34 for NTSC signals according to an input signal in PLL circuit 31, and oscillated frequency control of the local oscillator 26 is performed.

[0015]In addition to the effect described in the 1st working example, by sharing a local oscillator and a PLL circuit by the high-definition TV JON signal processing part and an NTSC signal treating part, reduction of circuit structure can be aimed at and a simple channel selection means by which only the local oscillator 26 performs frequency control is obtained in this example.

[0016]Drawing 3 is a block diagram of the receiving set in which the 3rd working example of this invention is shown. In the figure, the same number as drawing 1 and drawing 2 is given to the portion which performs the same operation as Fig. 1 and Fig. 2, and explanation is abbreviated to it.

[0017]This example also takes reduction of circuit structure into consideration. Namely, in the 1st and 2nd working example of the above, use the 1st mixer 10 for high-definition TV JON signals, and the 3rd mixer 22 is used for NTSC signals, To having performed frequency conversion which changes the reception channel of choice into the 1st IF signal or an IF signal, by this example, the mixer 10 is shared and frequency conversion is performed.

[0018]In addition to the effect described in the 1st and 2nd working example, in this example, reduction of circuit structure can be aimed at by sharing the mixer 10 by the high-definition TV JON signal processing part and an NTSC signal treating part.

[0019]Although not illustrated, the same effect as the above is acquired by sharing the 3rd either 1st IF amplifier 14 or IF amplifier 23 by the high-definition TV JON signal processing part and an NTSC signal treating part.

[0020]Drawing 4 is a block diagram of the receiving set in which the 4th working example of this invention is shown. In the figure, the same number as drawing 2 is given to the portion which performs the same operation as working example shown in drawing 2, and explanation is abbreviated to it. As for 39, in the figure, the 4th local oscillator and 50 are the demodulators for

high-definition TV JON signals in baseband the 4th mixer and 40.

[0021]This example gets over to a high-definition TV JON signal by carrying out frequency conversion of the 2nd IF signal to baseband further. Namely, in the 2nd working example of the above, the 2nd IF signal of 45 MHz bands outputted from the 2nd mixer 13 is amplified with 1st and 2nd IF amplifier 14 and 16 to a high-definition TV JON signal, After making zone selection by IF filter 15 for high-definition TV JON signals, input into the demodulator 33 for high-definition TV JON signals, and the recovery according to a modulation method to having carried out in this example. It mixes with the 2nd IF signal and the local oscillation signal of 45 MHz bands from the 4th local oscillator 40 with the 4th mixer, and the high-definition TV JON signal of baseband is outputted. Selection passage of this signal is carried out by the low pass filter 41, and it gets over with the demodulator 50 for high-definition TV JON signals in baseband.

[0022]In this example, since it can restore to a high-definition TV JON signal by the baseband of a low frequency area in addition to the effect described in the 1st and 2nd working example, the composition of the demodulator for high-definition TV JON signals becomes easy.

[0023]Drawing 5 is a block diagram of the receiving set in which the 5th working example of this invention is shown. In the figure, the same number as drawing 4 is given to the portion which performs the same operation as working example shown in drawing 4, and explanation is abbreviated to it. In the figure, the PLL circuit where 31 does not contain a reference oscillator, and 42 are counting-down circuits.

[0024]This example carries out dividing of the oscillation signal of the 4th local oscillator 40, and it is used for it as a reference oscillation signal of PLL circuit 31 which controls the oscillating frequency of the local oscillator 26. In the 4th mixer 39 that carries out frequency conversion of the IF signal of a high-definition TV JON signal to baseband, a local oscillation signal with high frequency precision is needed. Therefore, the oscillating circuit where the frequency stability which used a crystal oscillator, a SAW resonator, etc. is high consists of the 4th local oscillator 40. For this reason, it changed to the reference oscillator contained in the 2nd working example of the above in PLL circuit 31, and with the counting-down circuit 42, dividing of the oscillation signal of the 4th local oscillator 40 was carried out, and it was used.

[0025]In this example, since in addition to the effect described in the 4th working example dividing of the oscillation signal of the 4th local oscillator 40 is carried out and it is used as a reference oscillation signal of PLL circuit 31 with the counting-down circuit 42, circuit structure reduction of the oscillator portion of a receiving set can be aimed at, and the highly precise recovery of a high-definition TV JON signal is possible.

[0026]Hereafter, based on the form of a high-definition TV JON signal, more concrete working example is described using Drawings.

[0027]The block diagram of the receiving set which drawing 6 shows the 6th working example of this invention, and drawing 7 are the signal band figures supplementary to the 6th working example. In drawing 6, the same number as drawing 5 is given to the portion which performs the same operation as working example shown in drawing 5, and explanation is abbreviated to it. As for the 5th IF amplifier and 63, in the figure, a low pass filter, and 66 and 67 are the amplifiers for baseband signals the 5th mixer, and 64 and 65 the 1st IF filter for high-definition TV JON signals in 60, the 2nd IF filter for high-definition TV JON signals in 61, and 62.

[0028]This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 7, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal at drawing 7 for comparison. It is examined by the U.S. etc., for

example, the form of the high-definition TV JON signal compressed into a 6-MHz signal band is stated to the annual meeting etc. in detail in Fukui Mr. "trend in the West of advanced television method" pp.506-508, and Institute of Television Engineers of Japan 1992. In order to take into consideration the high-definition TV JON signal also when transmitted by the same channel as an NTSC signal, and to avoid the interference disturbance from an NTSC signal, Using the signal shown in drawing 7 which does not arrange the spectrum of a high-definition TV JON signal beforehand near [where the energy in an NTSC signal is high] an image and the sound carrier is proposed. Drawing 7 is signal forms which divide a signal with a high priority (H.P. section), and more than video carrier frequency into the other signal (SP section), and transmit below the video carrier frequency of an NTSC signal to the high-definition TV JON signal by which QAM was carried out. From the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out, this example by the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals that were constituted from an SAW filter. After separating this HP section and the SP section and amplifying with the 2nd IF amplifier 16 and 5th IF amplifier 62, frequency conversion is carried out to baseband with the 4th mixer 39 and the 5th mixer 63, respectively. After passing the low pass filters 64 and 65, with the amplifiers 66 and 67 for baseband signals, the HP section and the SP section which were changed into baseband are inputted into the demodulator 50 for high-definition TV JON signals as a desired signal level, respectively, and it restores to them. Although the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals were constituted from an SAW filter separated, respectively, zone separation is possible for them also with the filter constituted on the same substrate.

[0029]In order to have the effect described in the 5th working example in this example, and to divide a zone and to perform signal processing after double frequency conversion to the high-definition TV JON signal of the signal band shown in drawing 7, It becomes possible to fully reduce the disturbance from the NTSC signal transmitted by interference between both zones, or the same channel.

[0030]Drawing 8 is a block diagram of the receiving set in which the 7th working example of this invention is shown. In the figure, the same number as drawing 6 is given to the portion which performs the same operation as working example shown in drawing 6, and explanation is abbreviated to it. In the figure, the 1st QAM wave detector and 71 70 The 2nd QAM wave detector, 72 and 73 -- as for the 5th oscillator and 77, the 1st career and a clock reproduction circuit, and 75 are [an AFC voltage generation circuit and 51] data demodulators the 6th oscillator and 78 the 2nd career and a clock reproduction circuit, and 76 a 90-degree phase converter and 74.

[0031]This example by the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals that were constituted from an SAW filter from the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out. After separating the HP section of the above-mentioned high-definition TV JON signal, and the SP section and amplifying with the 2nd IF amplifier 16 and 5th IF amplifier 62, each with the 1st and 2nd QAM wave detectors 70 and 71. Electricity is detected using two signals which carry out the phase shift of the oscillation signal of the 5th and 6th oscillators 76 and 77 with the phase converters 72 and 73 90 degrees, and have the phase contrast of 90 degrees mutually. Under the present circumstances, the oscillating frequency of the local oscillator 26 is controlled by the AFC voltage generation circuit 78, and frequency control is performed so that it may be in the best state about the 1st and 2nd careers, the career in the clock reproduction circuits 74 and 75, and

clock signal reproduction. The detected signal is inputted into the data demodulators 51, and it restores to it. Although the oscillating frequency of the local oscillator 26 was controlled here, the composition which controls the oscillating frequency of the 2nd local oscillator 28, and the composition which controls the oscillating frequency of the 5th and 6th oscillators 76 and 77 may be used.

[0032]In order to have the effect described in the 6th working example in this example and to perform QAM demodulation to the HP section of the high-definition TV JON signal of the signal band shown in drawing 7, and the SP section, respectively, Highly precise data demodulation becomes it is possible to reduce further the disturbance from the NTSC signal transmitted by interference between both zones or the same channel, and possible. Since the oscillating frequency of the local oscillator 26 is controlled and QAM demodulation is performed, the recovery of a highly precise high-definition TV JON signal is attained.

[0033]The block diagram of the receiving set which drawing 9 shows the 8th working example of this invention, and drawing 10 are the signal band figures supplementary to the 8th working example. In drawing 9, the same number as drawing 2 is given to the portion which performs the same operation as working example shown in drawing 2, and explanation is abbreviated to it. In the figure, 52 is a demodulator for high-definition TV JON signals.

[0034]This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 10, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal like drawing 7 at drawing 10 for comparison. The figure is a signal band figure using the vestigial sideband amplitude modulation (VSB) of four values as other forms of the high-definition TV JON signal compressed into a 6-MHz signal band. This example carries out selection passage of the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out by IF filter 15 for high-definition TV JON signals constituted from an SAW filter, After amplifying with 2nd IF amplifier 16, it inputs into the AM demodulation machine 34 like the IF signal of an NTSC signal, and gets over. When it restores to an NTSC signal, a demodulation signal is outputted from the AM demodulation machine 34, but when it restores to a high-definition TV JON signal, it inputs into the demodulator 52 for high-definition TV JON signals further, and it gets over. In order to reduce the disturbance from the NTSC signal transmitted by the same channel, into the AM demodulation machine 34, the notch filter from which the subcarrier of the above-mentioned NTSC signal which operates at the time of high-definition TV JON signal reception, and a subcarrier are removed is provided. Generating of disturbance is reduced, also when the band pass filter which has the bandwidth for one channel, follows the oscillating frequency of the local oscillator 26, and changes the center frequency of the pass band into the input filter 6 is provided and the disturbance signal of a strong electric field inputs compared with the input signal of choice.

[0035]Since AM also of the high-definition TV JON signal is carried out in this example in addition to the effect described in the 2nd working example, A part of recovery of a highly minute signal can be performed using the demodulator of an NTSC signal, and control of AGC voltage or AFC voltage can also be performed in common, the circuitry of a receiving set is simplified, and it becomes possible to reduce circuit structure. Although IF filter 15 for high-definition TV JON signals and IF filter 24 for NTSC signals were separately formed in this example, When the vestigial sideband width and roll-off characteristics of a high-definition TV JON signal and an NTSC signal are similar, both can be shared, and circuit structure is reduced

further.

[0036]The block diagram of the receiving set which drawing 11 shows the 9th working example of this invention, and drawing 12 are the signal band figures supplementary to the 9th working example. In the figure, the same number as drawing 2 and drawing 8 is given to the portion which performs the same operation as working example shown in drawing 2 and drawing 8, and explanation is abbreviated to it. In the figure, 53 is the data demodulators for high-definition TV JON signals.

[0037]This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 12, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal like drawing 7 at drawing 12 for comparison. The figure is a signal band figure using the QAM abnormal conditions of sexadecimal of hexadecimal or 32 values as other forms of the high-definition TV JON signal compressed into a 6-MHz signal band. This example carries out selection passage of the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out by IF filter 15 for high-definition TV JON signals constituted from an SAW filter, After amplifying with 2nd IF amplifier 16, electricity is detected using two signals which carry out the phase shift of the oscillation signal of the 5th oscillator 76 with the phase converter 72 90 degrees, and have the phase contrast of 90 degrees mutually with the 1st QAM wave detector 70. Under the present circumstances, the oscillating frequency of the local oscillator 26 is controlled by the AFC voltage generation circuit 78, and frequency control is performed so that it may be in the best state about the 1st and 2nd careers, the career in the clock reproduction circuits 74 and 75, and clock signal reproduction. The detected signal is inputted into the data demodulators 53, and it restores to it. Although the oscillating frequency of the local oscillator 26 was controlled here, the composition which controls the oscillating frequency of the 2nd local oscillator 28, and the composition which controls the oscillating frequency of the 5th oscillator 76 may be used. The notch filter is provided in order to reduce the disturbance from the NTSC signal transmitted by the same channel, and to remove the subcarrier of the above-mentioned NTSC signal, and a subcarrier to the QAM wave detector 70.

[0038]In this example, since in addition to the effect described in the 2nd working example the oscillating frequency of the local oscillator 26 is controlled and QAM demodulation is performed, the recovery of a highly precise high-definition TV JON signal is attained.

[0039]Although working example described until now inputs an NTSC signal and a high-definition TV JON signal from the signal input terminal 1 and is considering them as the composition distributed with the distributor 5, two input terminals are provided and the effect same also as composition of inputting into each signal processing part is acquired.

[0040]Although old working example mainly described use by TV and VTR apparatus as a receiving set which receives an NTSC signal and a high-definition TV JON signal, the same effect is acquired even if it applies said receiving set to telecommunications sectors, such as digital communication.

[0041]

[Effect of the Invention]According to this invention, the receiving set which can receive the high-definition TV JON signal which it is compressed into an NTSC signal and a 6-MHz zone, and is transmitted can be provided. By what a channel selection circuit, a local oscillator, and the 1st mixer are shared by the NTSC signal and a high-definition TV JON signal, and an IF filter and a demodulator are individually formed for in an NTSC signal and high-definition TV JON

signals. The receiving set which receives the NTSC signal which reduced circuit structure, and a high-definition TV JON signal can be constituted.

TECHNICAL FIELD

[Industrial Application] This invention is a receiving set which can receive a high-definition TV JON signal and the usual television signal, It is related with the receiving set which carries out common reception of the signal especially compressed into a 6-MHz zone as a high-definition TV JON signal, and the NTSC signal which has a 6-MHz zone as a usual television signal.

PRIOR ART

[Description of the Prior Art] the Television Sub-Division broadcasting formats (NTSC, PAL, etc.) from recent years and the former -- in addition, establishment of the high-definition TV JON broadcasting format is advanced in each country. In connection with this, the receiving set with little image quality and tone quality degradation at the time of high-definition TV JON signal reception has been needed also in a receiving set. The conventional single superheterodyne system Television Sub-Division receiving set is shown in drawing 13. In the figure, 1 a signal input terminal and 2 a channel select signal input terminal and 4 An image and a voice signal output terminal, 17 and 21 -- variable tuning circuits, and 18 and 20 -- variable attenuator and 19 -- an RF amplifier and 22 -- as for a local oscillator and 29, an IF amplifier and 24 are [a PLL (phase locked loop) circuit and 34] AM demodulation machines a frequency converter, and 23 and 25 a low pass filter and 31 an IF filter and 26. The NTSC signal is used and explained to the standard television signal as an example after this.

[0003] By the NTSC signal inputted from the signal input terminal 1, among the RF signals by which AM was carried out a desired signal, It passes selectively in the variable tuning circuits 17 and 21 which follow the oscillating frequency of the local oscillator 26 and change the center frequency of the pass band, it amplifies or decreases suitably with the variable attenuators 18 and 20 and RF amplifier 19 so that a desired signal may serve as a desired receiving level, and it is inputted into the frequency converter 22. It mixes with the local oscillation signal from the local oscillator 26 which forms feedback by PLL circuit 31 and the low pass filter 29 so that it may oscillate on the frequency corresponding to a desired channel with the channel select signal inputted from the channel select signal input terminal 2 in the frequency converter 22, The IF signal of 45 MHz bands is outputted. An IF signal is amplified with the 1st and 2 IF amplifiers 23 and 25, and only a desired zone is passed by IF filter 24 which comprises an SAW filter etc., it gets over with the AM demodulation machine 34, and the image and audio signal of baseband are outputted. AGC is performed using the inside and the variable attenuators 18 and 20 of the AM demodulation machine 34. AFC carries out fine control of the oscillating frequency of the local oscillator 26, and performs it.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the receiving set which can receive the high-definition TV JON signal which it is compressed into an NTSC signal and a 6-MHz zone, and is transmitted can be provided. By what a channel selection circuit, a local oscillator, and the 1st mixer are shared by the NTSC signal and a high-definition TV JON signal, and an IF filter

and a demodulator are individually formed for in an NTSC signal and high-definition TV JON signals. The receiving set which receives the NTSC signal which reduced circuit structure, and a high-definition TV JON signal can be constituted.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, the above-mentioned receiving set receives the usual television signals, such as NTSC, and reception of the high-definition TV JON signal is not taken into consideration. Receiving both usual television signals and high-definition TV JON signals is not taken into consideration, either.

[0005]Both the purposes of this invention can receive a usual television signal and high-definition TV JON signal. It is in providing the receiving set which can receive the NTSC signal which has a 6-MHz zone as a usual television signal especially, and the signal compressed into a 6-MHz zone as a high-definition TV JON signal.

MEANS

[Means for Solving the Problem]In order to attain the above-mentioned purpose, in this invention, a single superheterodyne system performs NTSC signal processing, By a TERODAIN method, consider high-definition TV JON signal processing as composition to perform to a double supermarket which has the 1st and 2nd mixer, and to it about the double superheterodyne system. Set the 1st IF signal frequency as 1 GHz or more, and a band pass filter which has display flatness within a zone which does not degrade a recovery of a high-definition TV JON signal in the 1st IF filter, and a low group delay deviation is used, An SAW filter for high-definition TV JON signals was provided as the 2nd IF filter, and a demodulator for highly minute signals was formed as a demodulation section.

OPERATION

[Function]In this invention, the receiving set which can receive an NTSC signal and a high-definition TV JON signal can be provided by the above-mentioned composition. By what a channel selection circuit, a local oscillator, and the 1st mixer are shared at the time of an NTSC signal and high-definition TV JON signal reception, and the 2nd IF filter or an IF filter, and a demodulator are individually formed for in an NTSC signal and high-definition TV JON signals. The receiving set which receives the NTSC signal which circuit structure reduced, and a high-definition TV JON signal can be constituted.

EXAMPLE

[Example]Hereafter, Drawings explain working example of this invention.

[0009]Drawing 1 is a block diagram of the receiving set in which the 1st working example of this invention is shown.

[0010]In the figure, 1 a signal input terminal and 2 a channel select signal input terminal and 3 A high-definition TV JON signal output terminal, 4 the image for NTSC and a voice signal output terminal, and 5 a distributor and 6 An input filter, Variable attenuator, and 8 and 19 7, 9, 18, and 20 The 1st and 2nd RF amplifier, 10 the 1st mixer and 11 the 1st IF filter and 12 The 1st IF

amplifier, 13 the 2nd mixer and 14 the 1st IF amplifier and 15 The IF filter for high-definition TV JON signals, 16 the 2nd IF amplifier, and 17 and 21 variable tuning circuits and 22 The 3rd mixer, 23 the 3rd IF amplifier and 24 the IF filter for NTSC signals, and 25 The 4th IF amplifier, 26 the 3rd local oscillator and 27 the 1st local oscillator and 28 The 2nd local oscillator, 29 and 30 -- as for the AM demodulation machine for NTSC signals, and 35, a PLL circuit and 33 are [a low pass filter and 37] AGC voltage amplifiers a low pass filter, and 31 and 32 the demodulator for high-definition TV JON signals, and 34 the signal level wave detector for high-definition TV JON signals, and 36. In the figure, the same number as drawing 13 is given to the portion which performs the same operation as Fig. 13, and explanation is abbreviated to it.

[0011] When an NTSC signal is inputted, since it is the same as signal processing described by the conventional example, explanation is omitted here. Input the RF signal of high-definition TV JON which has the 6-MHz zone which carried out the after [an A/D conversion] data compression of the RF signal by which AM was carried out by the NTSC signal, and the HARASHIN item of high-definition TV JON, and was modulated by QAM (orthogonal-axis amplitude modulation) etc. from the signal input terminal 1, and the distributor 5 distributes, The input filter 6 divides the RF signal of this high-definition TV JON into a VHF band and a UHF band (a VHF band may be further divided into low-pass, a mid-range, and a high region.), and the zone containing a desired channel is passed selectively. To the desired channel, it amplifies or decreases suitably with the variable attenuators 7 and 9 and RF amplifier 8 so that it may be set to a desired signal level, and it inputs into the 1st mixer 10. In the 1st mixer 10. It mixes with the local oscillation signal from PLL circuit 32 which built in the reference oscillator and the counting-down circuit so that it might oscillate on the frequency corresponding to a desired channel with the channel select signal inputted from the channel select signal input terminal 2, and the local oscillator 27 which forms feedback by the low pass filter 30, The 1st IF signal is outputted. The 1st IF signal frequency is set up more than the upper limited frequency of the ground transmission band of an NTSC television signal, or a CATV transmission band in order to reduce the intermodulation interference of an input signal, etc. The mutual interference disturbance by the 1st local oscillation signal, the 2nd local oscillation signal, and its higher harmonic signal is also taken into consideration, and it is 1 GHz or more and, specifically, sets to 1.2 GHz bands, 1.7 GHz bands, 2.6 GHz bands, 3 GHz bands, etc. The 1st IF signal set as these frequency bands is selectively passed by 1st IF filter 11. The recovery of a high-definition TV JON signal needs a recovery higher-precision than an NTSC signal. In order not to degrade the demodulation characteristic of a high-definition TV JON signal, the band pass filter which has the display flatness within a zone and a low group delay deviation is used for the 1st IF filter. After amplifying the 1st IF signal with 1st IF amplifier 12, it is inputted into the 2nd mixer 13. In the 2nd mixer, it mixes with the local oscillation signal from the 2nd local oscillator 28, and the 2nd IF signal is outputted. Let the 2nd IF signal frequency be the same 45 MHz bands as the time of the present NTSC signal reception. It inputs into IF filter 15 for high-definition TV JON signals which comprises an SAW filter etc., after amplifying the 2nd IF signal with 1st IF amplifier 14. Only the zone of the reception channel of choice is passed by an IF filter. In receiving a high-definition TV JON signal, the reception channel of choice is amplified with 2nd IF amplifier 16, and it inputs into the demodulator 33 for high-definition TV JON signals, and the recovery according to a modulation method is performed and it outputs the high-definition TV JON signal by which the data compression was carried out from the output terminal 3. The outputted signal is inputted into the digital signal processing circuit which performs data decompression, D/A conversion, etc., and outputs an image and a sound, or data to high-

definition TV JON. On the other hand, when receiving an NTSC signal, the reception channel of choice is amplified with 4th IF amplifier 25, and it inputs into the AM demodulation machine 34 for NTSC signals, and AM demodulation is carried out and the image and audio signal of baseband are outputted from the output terminal 4. AGC detects the signal which branched from the output of 2nd IF amplifier 16 with the signal level wave detector 35, when receiving a high-definition TV JON signal, with the low pass filter 36 and the AGC voltage amplifier 37, it generates AGC voltage, impresses it to the variable attenuators 7 and 9, and is performed. When receiving an NTSC signal, the part which ran short an inside and inside the AM demodulation machine 34 is performed using the variable attenuators 18 and 20. Using each AFC voltage from the demodulator 33 for high-definition TV JON signals, and the AM demodulation machine 34 for NTSC signals, AFC carries out fine control of the oscillating frequency of the 2nd local oscillator 28 and the 3rd local oscillator 26, and performs it. Although mentioned later, In order to take into consideration the high-definition TV JON signal also when transmitted by the same channel as an NTSC signal, and to avoid the interference disturbance from an NTSC signal, Near [where the energy in an NTSC signal is high] an image and a sound carrier, and the chrominance subcarrier, It is required for using the signal shown in drawing 7 which does not arrange the spectrum of a high-definition TV JON signal beforehand, or the demodulator 33 for high-definition TV JON signals to provide the notch filter from which the subcarrier of the above-mentioned NTSC signal and a subcarrier are removed etc.

[0012]As explained above, reception of an NTSC signal and a high-definition TV JON signal is not only possible, but the receiving set of this example can be restored to a high-definition TV JON signal with high precision.

[0013]Drawing 2 is a block diagram of the receiving set in which the 2nd working example of this invention is shown. In the figure, the same number as drawing 1 is given to the portion which performs the same operation as Fig. 1, and explanation is abbreviated to it.

[0014]This example takes reduction of circuit structure into consideration. Namely, in the 1st working example of the above, the 3rd local oscillator 26 and PLL circuit 31 are used for high-definition TV JON signals the 1st local oscillator 27, PLL circuit 32, and for NTSC signals, Control the local oscillation signal frequency which changes the reception channel of choice into the 1st IF signal or an IF signal, and at the time of high-definition TV JON signal reception. The fine adjustment using AFC voltage to the 2nd local oscillator 28 having performed in this example. The local oscillator 26 and PLL circuit 31 are shared, the fine adjustment using AFC voltage also switches the AFC voltage from the demodulator 33 for high-definition TV JON signals, and the AM demodulation machine 34 for NTSC signals according to an input signal in PLL circuit 31, and oscillated frequency control of the local oscillator 26 is performed.

[0015]In addition to the effect described in the 1st working example, by sharing a local oscillator and a PLL circuit by the high-definition TV JON signal processing part and an NTSC signal treating part, reduction of circuit structure can be aimed at and a simple channel selection means by which only the local oscillator 26 performs frequency control is obtained in this example.

[0016]Drawing 3 is a block diagram of the receiving set in which the 3rd working example of this invention is shown. In the figure, the same number as drawing 1 and drawing 2 is given to the portion which performs the same operation as Fig. 1 and Fig. 2, and explanation is abbreviated to it.

[0017]This example also takes reduction of circuit structure into consideration. Namely, in the 1st and 2nd working example of the above, use the 1st mixer 10 for high-definition TV JON signals, and the 3rd mixer 22 is used for NTSC signals, To having performed frequency

conversion which changes the reception channel of choice into the 1st IF signal or an IF signal, by this example, the mixer 10 is shared and frequency conversion is performed.

[0018]In addition to the effect described in the 1st and 2nd working example, in this example, reduction of circuit structure can be aimed at by sharing the mixer 10 by the high-definition TV JON signal processing part and an NTSC signal treating part.

[0019]Although not illustrated, the same effect as the above is acquired by sharing the 3rd either 1st IF amplifier 14 or IF amplifier 23 by the high-definition TV JON signal processing part and an NTSC signal treating part.

[0020]Drawing 4 is a block diagram of the receiving set in which the 4th working example of this invention is shown. In the figure, the same number as drawing 2 is given to the portion which performs the same operation as working example shown in drawing 2, and explanation is abbreviated to it. As for 39, in the figure, the 4th local oscillator and 50 are the demodulators for high-definition TV JON signals in baseband the 4th mixer and 40.

[0021]This example gets over to a high-definition TV JON signal by carrying out frequency conversion of the 2nd IF signal to baseband further. Namely, in the 2nd working example of the above, the 2nd IF signal of 45 MHz bands outputted from the 2nd mixer 13 is amplified with 1st and 2nd IF amplifier 14 and 16 to a high-definition TV JON signal, After making zone selection by IF filter 15 for high-definition TV JON signals, input into the demodulator 33 for high-definition TV JON signals, and the recovery according to a modulation method to having carried out in this example. It mixes with the 2nd IF signal and the local oscillation signal of 45 MHz bands from the 4th local oscillator 40 with the 4th mixer, and the high-definition TV JON signal of baseband is outputted. Selection passage of this signal is carried out by the low pass filter 41, and it gets over with the demodulator 50 for high-definition TV JON signals in baseband.

[0022]In this example, since it can restore to a high-definition TV JON signal by the baseband of a low frequency area in addition to the effect described in the 1st and 2nd working example, the composition of the demodulator for high-definition TV JON signals becomes easy.

[0023]Drawing 5 is a block diagram of the receiving set in which the 5th working example of this invention is shown. In the figure, the same number as drawing 4 is given to the portion which performs the same operation as working example shown in drawing 4, and explanation is abbreviated to it. In the figure, the PLL circuit where 31 does not contain a reference oscillator, and 42 are counting-down circuits.

[0024]This example carries out dividing of the oscillation signal of the 4th local oscillator 40, and it is used for it as a reference oscillation signal of PLL circuit 31 which controls the oscillating frequency of the local oscillator 26. In the 4th mixer 39 that carries out frequency conversion of the IF signal of a high-definition TV JON signal to baseband, a local oscillation signal with high frequency precision is needed. Therefore, the oscillating circuit where the frequency stability which used a crystal oscillator, a SAW resonator, etc. is high consists of the 4th local oscillator 40. For this reason, it changed to the reference oscillator contained in the 2nd working example of the above in PLL circuit 31, and with the counting-down circuit 42, dividing of the oscillation signal of the 4th local oscillator 40 was carried out, and it was used.

[0025]In this example, since in addition to the effect described in the 4th working example dividing of the oscillation signal of the 4th local oscillator 40 is carried out and it is used as a reference oscillation signal of PLL circuit 31 with the counting-down circuit 42, circuit structure reduction of the oscillator portion of a receiving set can be aimed at, and the highly precise recovery of a high-definition TV JON signal is possible.

[0026]Hereafter, based on the form of a high-definition TV JON signal, more concrete working

example is described using Drawings.

[0027]The block diagram of the receiving set which drawing 6 shows the 6th working example of this invention, and drawing 7 are the signal band figures supplementary to the 6th working example. In drawing 6, the same number as drawing 5 is given to the portion which performs the same operation as working example shown in drawing 5, and explanation is abbreviated to it. As for the 5th IF amplifier and 63, in the figure, a low pass filter, and 66 and 67 are the amplifiers for baseband signals the 5th mixer, and 64 and 65 the 1st IF filter for high-definition TV JON signals in 60, the 2nd IF filter for high-definition TV JON signals in 61, and 62.

[0028]This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 7, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal at drawing 7 for comparison. It is examined by the U.S. etc., for example, the form of the high-definition TV JON signal compressed into a 6-MHz signal band is stated to the annual meeting etc. in detail in Fukui Mr. "trend in the West of advanced television method" pp.506-508, and Institute of Television Engineers of Japan 1992. In order to take into consideration the high-definition TV JON signal also when transmitted by the same channel as an NTSC signal, and to avoid the interference disturbance from an NTSC signal, Using the signal shown in drawing 7 which does not arrange the spectrum of a high-definition TV JON signal beforehand near [where the energy in an NTSC signal is high] an image and the sound carrier is proposed. Drawing 7 is signal forms which divide a signal with a high priority (H.P. section), and more than video carrier frequency into the other signal (SP section), and transmit below the video carrier frequency of an NTSC signal to the high-definition TV JON signal by which QAM was carried out. From the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out, this example by the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals that were constituted from an SAW filter. After separating this HP section and the SP section and amplifying with the 2nd IF amplifier 16 and 5th IF amplifier 62, frequency conversion is carried out to baseband with the 4th mixer 39 and the 5th mixer 63, respectively. After passing the low pass filters 64 and 65, with the amplifiers 66 and 67 for baseband signals, the HP section and the SP section which were changed into baseband are inputted into the demodulator 50 for high-definition TV JON signals as a desired signal level, respectively, and it restores to them. Although the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals were constituted from an SAW filter separated, respectively, zone separation is possible for them also with the filter constituted on the same substrate.

[0029]In order to have the effect described in the 5th working example in this example, and to divide a zone and to perform signal processing after double frequency conversion to the high-definition TV JON signal of the signal band shown in drawing 7, It becomes possible to fully reduce the disturbance from the NTSC signal transmitted by interference between both zones, or the same channel.

[0030]Drawing 8 is a block diagram of the receiving set in which the 7th working example of this invention is shown. In the figure, the same number as drawing 6 is given to the portion which performs the same operation as working example shown in drawing 6, and explanation is abbreviated to it. In the figure, the 1st QAM wave detector and 71 70 The 2nd QAM wave detector, 72 and 73 -- as for the 5th oscillator and 77, the 1st career and a clock reproduction circuit, and 75 are [an AFC voltage generation circuit and 51] data demodulators the 6th oscillator and 78 the 2nd career and a clock reproduction circuit, and 76 a 90-degree phase

converter and 74.

[0031] This example by the 1st IF filter 60 and 2nd IF filter 61 for high-definition TV JON signals that were constituted from an SAW filter from the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out. After separating the HP section of the above-mentioned high-definition TV JON signal, and the SP section and amplifying with the 2nd IF amplifier 16 and 5th IF amplifier 62, each with the 1st and 2nd QAM wave detectors 70 and 71. Electricity is detected using two signals which carry out the phase shift of the oscillation signal of the 5th and 6th oscillators 76 and 77 with the phase converters 72 and 73 90 degrees, and have the phase contrast of 90 degrees mutually. Under the present circumstances, the oscillating frequency of the local oscillator 26 is controlled by the AFC voltage generation circuit 78, and frequency control is performed so that it may be in the best state about the 1st and 2nd careers, the career in the clock reproduction circuits 74 and 75, and clock signal reproduction. The detected signal is inputted into the data demodulators 51, and it restores to it. Although the oscillating frequency of the local oscillator 26 was controlled here, the composition which controls the oscillating frequency of the 2nd local oscillator 28, and the composition which controls the oscillating frequency of the 5th and 6th oscillators 76 and 77 may be used.

[0032] In order to have the effect described in the 6th working example in this example and to perform QAM demodulation to the HP section of the high-definition TV JON signal of the signal band shown in drawing 7, and the SP section, respectively, Highly precise data demodulation becomes it is possible to reduce further the disturbance from the NTSC signal transmitted by interference between both zones or the same channel, and possible. Since the oscillating frequency of the local oscillator 26 is controlled and QAM demodulation is performed, the recovery of a highly precise high-definition TV JON signal is attained.

[0033] The block diagram of the receiving set which drawing 9 shows the 8th working example of this invention, and drawing 10 are the signal band figures supplementary to the 8th working example. In drawing 9, the same number as drawing 2 is given to the portion which performs the same operation as working example shown in drawing 2, and explanation is abbreviated to it. In the figure, 52 is a demodulator for high-definition TV JON signals.

[0034] This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 10, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal like drawing 7 at drawing 10 for comparison. The figure is a signal band figure using the vestigial sideband amplitude modulation (VSB) of four values as other forms of the high-definition TV JON signal compressed into a 6-MHz signal band. This example carries out selection passage of the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out by IF filter 15 for high-definition TV JON signals constituted from an SAW filter, After amplifying with 2nd IF amplifier 16, it inputs into the AM demodulation machine 34 like the IF signal of an NTSC signal, and gets over. When it restores to an NTSC signal, a demodulation signal is outputted from the AM demodulation machine 34, but when it restores to a high-definition TV JON signal, it inputs into the demodulator 52 for high-definition TV JON signals further, and it gets over. In order to reduce the disturbance from the NTSC signal transmitted by the same channel, into the AM demodulation machine 34, the notch filter from which the subcarrier of the above-mentioned NTSC signal which operates at the time of high-definition TV JON signal reception, and a subcarrier are removed is provided. Generating of disturbance is reduced, also when the band

pass filter which has the bandwidth for one channel, follows the oscillating frequency of the local oscillator 26, and changes the center frequency of the pass band into the input filter 6 is provided and the disturbance signal of a strong electric field inputs compared with the input signal of choice.

[0035] Since AM also of the high-definition TV JON signal is carried out in this example in addition to the effect described in the 2nd working example, A part of recovery of a highly minute signal can be performed using the demodulator of an NTSC signal, and control of AGC voltage or AFC voltage can also be performed in common, the circuitry of a receiving set is simplified, and it becomes possible to reduce circuit structure. Although IF filter 15 for high-definition TV JON signals and IF filter 24 for NTSC signals were separately formed in this example, When the vestigial sideband width and roll-off characteristics of a high-definition TV JON signal and an NTSC signal are similar, both can be shared, and circuit structure is reduced further.

[0036] The block diagram of the receiving set which drawing 11 shows the 9th working example of this invention, and drawing 12 are the signal band figures supplementary to the 9th working example. In the figure, the same number as drawing 2 and drawing 8 is given to the portion which performs the same operation as working example shown in drawing 2 and drawing 8, and explanation is abbreviated to it. In the figure, 53 is the data demodulators for high-definition TV JON signals.

[0037] This example receives the high-definition TV JON signal which has a baseband signal zone shown in drawing 12, and an NTSC signal. The image and sound carrier (fv, fs), and chrominance subcarrier (fc) of the NTSC signal were shown in the frequency spectrum of the high-definition TV JON signal like drawing 7 at drawing 12 for comparison. The figure is a signal band figure using the QAM abnormal conditions of sexadecimal of hexadecimal or 32 values as other forms of the high-definition TV JON signal compressed into a 6-MHz signal band. This example carries out selection passage of the 2nd IF signal of the high-definition TV JON signal by which double frequency conversion was carried out by IF filter 15 for high-definition TV JON signals constituted from an SAW filter, After amplifying with 2nd IF amplifier 16, electricity is detected using two signals which carry out the phase shift of the oscillation signal of the 5th oscillator 76 with the phase converter 72 90 degrees, and have the phase contrast of 90 degrees mutually with the 1st QAM wave detector 70. Under the present circumstances, the oscillating frequency of the local oscillator 26 is controlled by the AFC voltage generation circuit 78, and frequency control is performed so that it may be in the best state about the 1st and 2nd careers, the career in the clock reproduction circuits 74 and 75, and clock signal reproduction. The detected signal is inputted into the data demodulators 53, and it restores to it. Although the oscillating frequency of the local oscillator 26 was controlled here, the composition which controls the oscillating frequency of the 2nd local oscillator 28, and the composition which controls the oscillating frequency of the 5th oscillator 76 may be used. The notch filter is provided in order to reduce the disturbance from the NTSC signal transmitted by the same channel, and to remove the subcarrier of the above-mentioned NTSC signal, and a subcarrier to the QAM wave detector 70.

[0038] In this example, since in addition to the effect described in the 2nd working example the oscillating frequency of the local oscillator 26 is controlled and QAM demodulation is performed, the recovery of a highly precise high-definition TV JON signal is attained.

[0039] Although working example described until now inputs an NTSC signal and a high-definition TV JON signal from the signal input terminal 1 and is considering them as the

composition distributed with the distributor 5, two input terminals are provided and the effect same also as composition of inputting into each signal processing part is acquired.

[0040]Although old working example mainly described use by TV and VTR apparatus as a receiving set which receives an NTSC signal and a high-definition TV JON signal, the same effect is acquired even if it applies said receiving set to telecommunications sectors, such as digital communication.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the 1st working example of this invention.

[Drawing 2]It is a block diagram showing the 2nd working example.

[Drawing 3]It is a block diagram showing the 3rd working example.

[Drawing 4]It is a block diagram showing the 4th working example.

[Drawing 5]It is a block diagram showing the 5th working example.

[Drawing 6]It is a block diagram showing the 6th working example.

[Drawing 7]It is a signal band figure supplementary to the 6th working example.

[Drawing 8]It is a block diagram showing the 7th working example.

[Drawing 9]It is a block diagram showing the 8th working example.

[Drawing 10]It is a signal band figure supplementary to the 8th working example.

[Drawing 11]It is a block diagram showing the 9th working example.

[Drawing 12]It is a signal band figure supplementary to the 9th working example.

[Drawing 13]It is a block diagram showing a conventional example.

[Description of Notations]

- 1 -- Signal input terminal,
- 2 -- Channel select signal input terminal,
- 3 -- High-definition TV JON signal output terminal,
- 4 -- NTSC signal output terminal,
- 5 -- Distributor,
- 7, 9, 18, 20 -- Variable attenuator,
- 8, 19 -- The 1st and 2nd RF amplifier,
- 10 -- The 1st mixer,
- 11 -- The 1st IF filter,
- 12 -- The 1st IF amplifier,
- 13 -- The 2nd mixer,
- 14 -- The 1st IF amplifier,
- 15, 60, 61 -- IF filter for high-definition TV JON signals,
- 16 -- The 2nd IF amplifier,
- 17, 21 -- Variable tuning circuits,
- 22 -- The 3rd mixer,
- 23 -- The 3rd IF amplifier,
- 24 -- IF filter for NTSC signals,
- 25 -- The 4th IF amplifier,
- 26 -- The 3rd local oscillator,
- 27 -- The 1st local oscillator for high-definition TV JON signals,
- 28 -- The 2nd local oscillator,

29, 30, 36, 41, 64, 65, -- low pass filter,
31, 32 -- PLL circuit
33, 50, 51, 52, 53 -- Demodulator for high-definition TV JON signals,
34 -- Demodulator for NTSC signals,
35 -- Level detector for high-definition TV JON signals,
37 -- AGC voltage amplifier,
39 -- The 4th mixer,
40 -- The 4th local oscillator,
42 -- Counting-down circuit,
62 -- The 5th IF amplifier,
63 -- The 5th mixer,
66, 67 -- Amplifier for baseband signals,
70, 71 -- QAM wave detector,
72, a 73--90-degree phase converter,
74, 75 -- A carrier and clock reproduction circuit,
76, 77 -- Reference oscillator,
78 -- AFC voltage generator.

[Translation done.]

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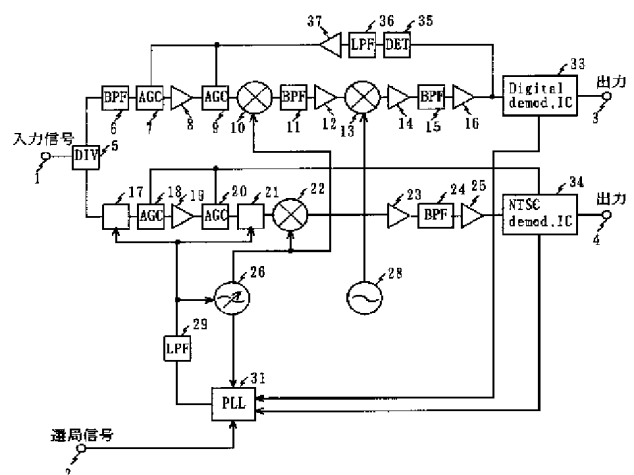
(54)【発明の名称】 受信装置

(57)【要約】 (修正有)

【目的】高精細テレビジョン信号と通常のテレビジョン信号を受信することが可能な受信装置で、特に、高精細テレビジョン信号として6MHzの帯域に圧縮された信号と、通常のテレビジョン信号として6MHzの帯域を有するNTSC信号を共用受信する受信装置を提供することにある。

【構成】シングルスーパーヘテロダイン方式のNTSC信号処理部24、34とダブルスーパーヘテロダイン方式の高精細テレビジョン信号処理部を設け、高精細テレビジョン信号処理部の第1IF信号周波数を1GHz以上に設定し、第1IFフィルタ15に高精細テレビジョン信号の復調を劣化させない帯域内平坦度と低群遅延偏差を有するバンドパスフィルタを用い、第2IFフィルタとして高精細テレビジョン信号用SAWフィルタを設け、復調部として高精細信号用復調器33を設けた。

図 2



【特許請求の範囲】

【請求項1】標準TV信号（NTSC、PAL、SECAMなど）により変調されたRF信号と、高精細テレビジョン信号により変調されたRF信号が入力され、それぞれの信号を復調して出力する受信装置において、該AM変調された高精細テレビジョン信号を処理する高精細テレビジョン信号処理部を、少なくとも、選局情報によりPLL回路を用いて発振周波数制御を行う第1の局部発振器と、希望信号を第1IF信号に変換する第1の周波数変換器と、第2の局部発振器と、第2IF信号に変換する第2の周波数変換器と、第2IF信号を入力し復調する復調器とから構成されるダブルスーパーヘテロダイン方式とし、該AM変調された標準TV信号を処理する標準TV信号処理部を、少なくとも、選局情報によりPLL回路を用いて発振周波数制御を行う局部発振器と、希望信号をIF信号に変換する周波数変換器と、IF信号を入力し復調する復調器とから構成されるシングルスーパーヘテロダイン方式で構成したことを特徴とする受信装置。

【請求項2】請求項1に記載の受信装置において、前記高精細テレビジョン信号処理部のAGC電圧を、高精細テレビジョン信号の第2IF信号を検波する検波器と、該検波出力を通過させるローパスフィルタと、該ローパスフィルタの出力を所望の電圧値に増幅する増幅器により生成することを特徴とする受信装置。

【請求項3】請求項1又は請求項2に記載の受信装置において、前記高精細テレビジョン信号処理部に含まれる、PLL回路を用いて発振周波数制御を行う第1の局部発振器、あるいは前記標準TV信号処理部に含まれる、PLL回路を用いて発振周波数制御を行う局部発振器のいずれかのPLL回路と局部発振器を共用し、また高精細テレビジョン用復調器から出力される高精細テレビジョン信号用AFC電圧と標準TV信号用復調器から出力される標準TV信号用AFC電圧を前記PLL回路で切り換えて周波数制御に用いる構成としたことを特徴とする受信装置。

【請求項4】請求項3に記載の受信装置において、前記高精細テレビジョン信号処理部に含まれる、希望信号を第1IF信号に変換する第1の周波数変換器、あるいは前記標準TV信号処理部に含まれる、希望信号をIF信号に変換する周波数変換器のいずれかの周波数変換器を共用したことを特徴とする受信装置。

【請求項5】請求項1又は請求項2又は請求項3又は請求項4に記載の受信装置において、前記高精細テレビジョン信号処理部に、第3の局部発振器と、該第3の局部発振器から出力される局部発振信号と前記第2IF信号を入力しベースバンド信号に変換する第3の周波数変換器と、該ベースバンドの高精細テレビジョン信号用復調器とを設けたことを特徴とする受信装置。

【請求項6】請求項5に記載の受信装置において、第3

の局部発振器を水晶振動子を用いた発振回路で構成し、該第3の局部発振器から出力される局部発振信号を分周して出力する分周器を設け、該分周信号をPLL回路の基準信号として用いることを特徴とする受信装置。

【発明の詳細な説明】**【0001】**

【産業上の利用分野】本発明は、高精細テレビジョン信号と通常のテレビジョン信号を受信することが可能な受信装置で、特に、高精細テレビジョン信号として6MHzの帯域に圧縮された信号と、通常のテレビジョン信号として6MHzの帯域を有するNTSC信号を共用受信する受信装置に関する。

【0002】

【従来の技術】近年、従来からのテレビジョン放送方式（NTSC、PAL等）に加えて、高精細テレビジョン放送方式の確立が各国で進められている。これに伴い、受信装置においても、高精細テレビジョン信号受信時の画質・音質劣化が少ない受信装置が必要になってきた。図13に従来のシングルスーパーヘテロダイン方式テレビジョン受信装置を示す。同図において、1は信号入力端子、2は選局信号入力端子、4は映像及び音声信号出力端子、17、21は可変同調回路、18、20は可変減衰器、19はRF増幅器、22は周波数変換器、23、25はIF増幅器、24はIFフィルタ、26は局部発振器、29はローパスフィルタ、31はPLL（フェーズロックループ）回路、34はAM復調器である。また、これ以降は、例として標準TV信号にNTSC信号を用いて説明していく。

【0003】信号入力端子1から入力されるNTSC信号でAM変調されたRF信号のうち希望信号は、局部発振器26の発振周波数に追従してその通過帯域の中心周波数を可変する可変同調回路17、21で選択的に通過され、希望信号が所望の受信レベルとなるよう可変減衰器18、20及びRF増幅器19で適宜増幅あるいは減衰され、周波数変換器22に入力される。周波数変換器22では、選局信号入力端子2から入力される選局信号により希望チャンネルに対応した周波数で発振を行うようPLL回路31、ローパスフィルタ29でフィードバックを形成してなる局部発振器26からの局部発振信号と混合し、45MHz帯のIF信号を出力する。IF信号は第1、2のIF増幅器23、25で増幅されると共に、SAWフィルタ等で構成されるIFフィルタ24で所望の帯域のみが通過され、AM復調器34で復調され、ベースバンドの映像及び音声信号が出力される。AGCはAM復調器34の内部と可変減衰器18、20を用いて行う。また、AFCは局部発振器26の発振周波数を微調して行う。

【0004】

【発明が解決しようとする課題】しかしながら、上記の受信装置は、NTSC等通常のテレビジョン信号を受信

するものであり、高精細テレビジョン信号の受信は考慮されていない。また、通常のテレビジョン信号と高精細テレビジョン信号を共に受信することも考慮されていない。

【0005】本発明の目的は、通常のテレビジョン信号と高精細テレビジョン信号を共に受信することが可能で、特に、通常のテレビジョン信号として6MHzの帯域を有するNTSC信号と、高精細テレビジョン信号として6MHzの帯域に圧縮された信号を受信可能な受信装置を提供することにある。

【0006】

【課題を解決するための手段】上記した目的を達成するため、本発明では、NTSC信号処理をシングルスーパーヘテロダイン方式で行い、高精細テレビジョン信号処理を第1、第2のミキサを有するダブルスーパーヘテロダイン方式で行う構成とし、そのダブルスーパーヘテロダイン方式については、第1IF信号周波数を1GHz以上に設定し、第1IFフィルタに高精細テレビジョン信号の復調を劣化させない帯域内平坦度と低群遅延偏差を有するバンドパスフィルタを用い、第2IFフィルタとして高精細テレビジョン信号用SAWフィルタを設け、復調部として高精細信号用復調器を設けた。

【0007】

【作用】本発明では、上記構成により、NTSC信号と高精細テレビジョン信号を受信可能な受信装置を提供できる。また、選局回路、局部発振器、第1ミキサをNTSC信号と高精細テレビジョン信号受信時に共用し、第2IFフィルタあるいはIFフィルタと復調器をNTSC信号と高精細テレビジョン信号用に個別に設けることで、回路規模の低減したNTSC信号、高精細テレビジョン信号を受信する受信装置が構成できる。

【0008】

【実施例】以下、本発明の実施例を図面により説明する。

【0009】図1は、本発明の第1の実施例を示す受信装置のブロック図である。

【0010】同図において、1は信号入力端子、2は選局信号入力端子、3は高精細テレビジョン信号出力端子、4はNTSC用映像及び音声信号出力端子、5は分配器、6は入力フィルタ、7、9、18、20は可変減衰器、8、19は第1、第2のRF増幅器、10は第1ミキサ、11は第1IFフィルタ、12は第1IF増幅器、13は第2ミキサ、14は第1のIF増幅器、15は高精細テレビジョン信号用IFフィルタ、16は第2のIF増幅器、17、21は可変同調回路、22は第3ミキサ、23は第3のIF増幅器、24はNTSC信号用IFフィルタ、25は第4のIF増幅器、26は第3の局部発振器、27は第1の局部発振器、28は第2の局部発振器、29、30はローパスフィルタ、31、32はPLL回路、33は高精細テレビジョン信号用復調

器、34はNTSC信号用AM復調器、35は高精細テレビジョン信号用信号レベル検波器、36はローパスフィルタ、37はAGC電圧増幅器である。同図において、第13図と同様の動作を行う部分には、図13と同一の番号を付し説明を略す。

【0011】NTSC信号が入力された場合には、従来例で述べた信号処理と同じなのでここでは説明を省略する。信号入力端子1から、NTSC信号でAM変調されたRF信号と、高精細テレビジョンの原信号をA/D変換後データ圧縮しQAM（直交軸振幅変調）等で変調された6MHzの帯域を有する高精細テレビジョンのRF信号を入力し、分配器5で分配し、該高精細テレビジョンのRF信号については入力フィルタ6でVHF帯、UHF帯（さらには、VHF帯を低域、中域、高域に分割する場合もある。）に分割し、希望チャネルを含む帯域を選択的に通過させる。その希望チャネルに対し、所望の信号レベルとなるよう可変減衰器7、9及びRF増幅器8で適宜増幅あるいは減衰し、第1ミキサ10へ入力する。第1ミキサ10では、選局信号入力端子2から入力される選局信号により希望チャネルに対応した周波数で発振を行うよう基準発振器や分周器を内蔵したPLL回路32、ローパスフィルタ30でフィードバックを形成してなる局部発振器27からの局部発振信号と混合し、第1IF信号を出力する。第1IF信号周波数は受信信号の相互変調妨害などを低減するため、NTSCテレビジョン信号の地上伝送帯域やCATV伝送帯域の上限周波数以上に設定する。具体的には、第1局部発振信号や第2局部発振信号及びその高調波信号による相互干渉妨害も考慮して、1GHz以上で、1.2GHz帯、1.7GHz帯、2.6GHz帯、3GHz帯等に設定する。これらの周波数帯に設定された第1IF信号を第1IFフィルタ11で選択的に通過させる。高精細テレビジョン信号の復調はNTSC信号より精度の高い復調を必要とする。高精細テレビジョン信号の復調特性を劣化させないため、第1IFフィルタには帯域内平坦度と低群遅延偏差を有するバンドパスフィルタを用いる。第1IF信号は第1IF増幅器12で増幅した後第2ミキサ13へ入力する。第2ミキサでは第2の局部発振器28からの局部発振信号と混合し、第2IF信号を出力する。第2IF信号周波数は現行NTSC信号受信時と同じ45MHz帯とする。第2IF信号を第1のIF増幅器14で増幅した後、SAWフィルタ等で構成される高精細テレビジョン信号用IFフィルタ15へ入力する。IFフィルタで希望受信チャネルの帯域のみを通過させる。高精細テレビジョン信号を受信する場合には、第2のIF増幅器16で希望受信チャネルを増幅し高精細テレビジョン信号用復調器33へ入力し、変調方式に応じた復調を行い、データ圧縮された高精細テレビジョン信号を出力端子3から出力する。出力された信号はデータ伸長やD/A変換などを行うデジタル信号処理回路へ入

力され、高精細テレビジョンに映像及び音声あるいはデータを出力する。一方、NTSC信号を受信する場合には、第4のIF増幅器25で希望受信チャンネルを増幅しNTSC信号用AM復調器34に入力し、AM復調され、ベースバンドの映像及び音声信号が出力端子4から出力される。AGCは、高精細テレビジョン信号を受信する場合は第2のIF増幅器16の出力から分岐した信号を信号レベル検波器35で検波し、ローパスフィルタ36、AGC電圧増幅器37によってAGC電圧を生成し、可変減衰器7、9に印加して行く。またNTSC信号を受信する場合はAM復調器34の内部と内部で不足した分を可変減衰器18、20を用いて行く。また、AFCは高精細テレビジョン信号用復調器33、NTSC信号用AM復調器34からのそれぞれのAFC電圧を用い、第2の局部発振器28、第3の局部発振器26の発振周波数を微調整して行く。なお、後述するが、高精細テレビジョン信号はNTSC信号と同一のチャンネルで伝送される場合も考慮されており、NTSC信号からの干渉妨害を避けるため、NTSC信号中エネルギーの高い映像及び音声搬送波と色副搬送波の近傍には、予め高精細テレビジョン信号のスペクトルを配置しない図7に示した信号を用いることや高精細テレビジョン信号用復調器33に上記NTSC信号の搬送波、副搬送波を除去するノッチフィルタを設けることなどが必要である。

【0012】以上説明したように、本実施例の受信装置は、NTSC信号と高精細テレビジョン信号の受信が可能であるだけでなく、高精細テレビジョン信号を高精度に復調することが可能である。

【0013】図2は、本発明の第2の実施例を示す受信装置のブロック図である。同図において、第1図と同様の動作を行う部分には、図1と同一の番号を付し説明を略す。

【0014】本実施例は回路規模の低減を考慮したものである。即ち、上記第1の実施例では高精細テレビジョン信号用に第1の局部発振器27とPLL回路32、NTSC信号用に第3の局部発振器26とPLL回路31を用いて、希望受信チャンネルを第1IF信号あるいはIF信号に変換する局部発振信号周波数の制御を行い、高精細テレビジョン信号受信時には、AFC電圧を用いた微調整を第2の局部発振器28で行っていたのに対し、本実施例では、局部発振器26とPLL回路31を共用し、AFC電圧を用いた微調整もPLL回路31内で高精細テレビジョン信号用復調器33、NTSC信号用AM復調器34からのAFC電圧を受信信号に応じて切換えて局部発振器26の発振周波数制御を行っている。

【0015】本実施例では、第1の実施例で述べた効果に加え、高精細テレビジョン信号処理部とNTSC信号処理部で局部発振器とPLL回路を共用することにより、回路規模の低減が図れ、周波数制御を局部発振器26だけで行う簡便な選局手段が得られる。

【0016】図3は、本発明の第3の実施例を示す受信装置のブロック図である。同図において、第1図、第2図と同様の動作を行う部分には、図1、図2と同一の番号を付し説明を略す。

【0017】本実施例も回路規模の低減を考慮したものである。即ち、上記第1、第2の実施例では高精細テレビジョン信号用に第1ミキサ10、NTSC信号用に第3ミキサ22を用いて、希望受信チャンネルを第1IF信号あるいはIF信号に変換する周波数変換を行っていたのに対し、本実施例では、ミキサ10を共用し周波数変換を行っている。

【0018】本実施例では、第1、第2の実施例で述べた効果に加え、高精細テレビジョン信号処理部とNTSC信号処理部でミキサ10を共用することにより、回路規模の低減が図れる。

【0019】また、図示していないが、第1のIF増幅器14と第3のIF増幅器23のいずれかを高精細テレビジョン信号処理部とNTSC信号処理部で共用することにより、上記と同様な効果が得られる。

【0020】図4は本発明の第4の実施例を示す受信装置のブロック図である。同図において、図2に示した実施例と同様の動作を行う部分には、図2と同一の番号を付し説明を略す。同図において、39は第4ミキサ、40は第4の局部発振器、50はベースバンドでの高精細テレビジョン信号用復調器である。

【0021】本実施例は高精細テレビジョン信号に対し、第2IF信号をさらにベースバンドへ周波数変換し復調を行うことを特徴とする。即ち、上記第2の実施例では高精細テレビジョン信号に対し、第2ミキサ13から出力した45MHz帯の第2IF信号を第1、第2のIF増幅器14、16で増幅し、高精細テレビジョン信号用IFフィルタ15で帯域選択した後、高精細テレビジョン信号用復調器33に入力し、変調方式に応じた復調を行っていたのに対し、本実施例では、第4ミキサで第2IF信号と第4の局部発振器40からの45MHz帯の局部発振信号と混合し、ベースバンドの高精細テレビジョン信号を出力する。この信号をローパスフィルタ41で選択通過させ、ベースバンドでの高精細テレビジョン信号用復調器50で復調を行う。

【0022】本実施例では、第1、第2の実施例で述べた効果に加え、高精細テレビジョン信号の復調を低周波域のベースバンドで行えるため、高精細テレビジョン信号用復調器の構成が簡単になる。

【0023】図5は本発明の第5の実施例を示す受信装置のブロック図である。同図において、図4に示した実施例と同様の動作を行う部分には、図4と同一の番号を付し説明を略す。同図において、31は基準発振器を含まないPLL回路、42は分周器である。

【0024】本実施例は、第4の局部発振器40の発振信号を分周して、局部発振器26の発振周波数を制御す

るPLL回路31の基準発振信号として用いることを特徴とする。高精細テレビジョン信号のIF信号をベースバンドへ周波数変換する第4ミキサ39では、周波数精度の高い局部発振信号が必要になる。従って、第4の局部発振器40では水晶振動子やSAW共振子等を用いた周波数安定度の高い発振回路を構成している。このため、上記第2の実施例でPLL回路31に含まれていた基準発振器に替えて、第4の局部発振器40の発振信号を分周器42で分周して用いた。

【0025】本実施例では、第4の実施例で述べた効果に加え、第4の局部発振器40の発振信号を分周器42で分周してPLL回路31の基準発振信号として用いるので、受信装置の発振器部分の回路規模低減が図れると共に、高精細テレビジョン信号の高精度な復調が可能である。

【0026】以下、高精細テレビジョン信号の形式に基づいて、より具体的な実施例を図面を用いて説明する。

【0027】図6は本発明の第6の実施例を示す受信装置のブロック図、図7は第6の実施例を補足する信号帯域図である。図6において、図5に示した実施例と同様の動作を行う部分には、図5と同一の番号を付し説明を略す。同図において、60は高精細テレビジョン信号用の第1のIFフィルタ、61は高精細テレビジョン信号用の第2のIFフィルタ、62は第5のIF増幅器、63は第5ミキサ、64、65はローパスフィルタ、66、67はベースバンド信号用増幅器である。

【0028】本実施例は、図7に示すベースバンド信号帯域を有する高精細テレビジョン信号と、NTSC信号を受信することの特徴とする。図7には高精細テレビジョン信号の周波数スペクトルに、比較のためNTSC信号の映像及び音声搬送波(f_v 、 f_s)と色副搬送波(f_c)を示した。6MHzの信号帯域に圧縮する高精細テレビジョン信号の形式については、米国等で検討されており、例えば福井氏「次世代テレビ方式の欧米における動向」pp. 506-508、テレビジョン学会1992年年次大会、等に詳細に述べられている。高精細テレビジョン信号はNTSC信号と同一のチャンネルで伝送される場合も考慮されており、NTSC信号からの干渉妨害を避けるため、NTSC信号中エネルギーの高い映像及び音声搬送波の近傍には、予め高精細テレビジョン信号のスペクトルを配置しない図7に示した信号を用いることが提案されている。図7はQAMされた高精細テレビジョン信号に対し、NTSC信号の映像搬送波周波数以下を優先度の高い信号(HP部)、映像搬送波周波数以上をそれ以外の信号(SP部)に分割して伝送する信号形式である。本実施例は二重周波数変換された高精細テレビジョン信号の第2IF信号から、SAWフィルタで構成した高精細テレビジョン信号用の第1のIFフィルタ60及び第2のIFフィルタ61により、このHP部、SP部を分離し、第2のIF増幅器16及び第

5のIF増幅器62で増幅した後、第4ミキサ39及び第5ミキサ63でそれぞれベースバンドへ周波数変換する。ベースバンドに変換したHP部、SP部はそれぞれローパスフィルタ64、65を通過後、ベースバンド信号用増幅器66、67で所望の信号レベルとして高精細テレビジョン信号用復調器50へ入力し、復調する。なお、高精細テレビジョン信号用の第1のIFフィルタ60及び第2のIFフィルタ61は、それぞれ分離されたSAWフィルタで構成したが、同一の基板上に構成されたフィルタでも帯域分離は可能である。

【0029】本実施例では、第5の実施例で述べた効果を有すると共に、図7に示した信号帯域の高精細テレビジョン信号に対し、二重周波数変換後、帯域を分割して信号処理を行うため、両帯域間の干渉や同一チャンネルで伝送されるNTSC信号からの妨害を十分に低減することが可能となる。

【0030】図8は本発明の第7の実施例を示す受信装置のブロック図である。同図において、図6に示した実施例と同様の動作を行う部分には、図6と同一の番号を付し説明を略す。同図において、70は第1のQAM検波器、71は第2のQAM検波器、72、73は90度移相器、74は第1のキャリア及びクロック再生回路、75は第2のキャリア及びクロック再生回路、76は第5の発振器、77は第6の発振器、78はAFC電圧発生回路、51はデータ復調器である。

【0031】本実施例は、二重周波数変換された高精細テレビジョン信号の第2IF信号から、SAWフィルタで構成した高精細テレビジョン信号用の第1のIFフィルタ60及び第2のIFフィルタ61により、上記高精細テレビジョン信号のHP部、SP部を分離し、第2のIF増幅器16及び第5のIF増幅器62で増幅した後、それぞれを第1及び第2のQAM検波器70、71で、第5及び第6の発振器76、77の発振信号を90度移相器72、73で移相して互いに90度の位相差を有する2信号を用いて検波する。この際、AFC電圧発生回路78で局部発振器26の発振周波数を制御し、第1及び第2のキャリア及びクロック再生回路74、75でのキャリア及びクロック信号再生を最良状態となるように周波数制御を行う。検波された信号はデータ復調器51へ入力し、復調する。なお、ここでは局部発振器26の発振周波数を制御したが、第2の局部発振器28の発振周波数を制御する構成や第5及び第6の発振器76、77の発振周波数を制御する構成でもよい。

【0032】本実施例では、第6の実施例で述べた効果を有すると共に、図7に示した信号帯域の高精細テレビジョン信号のHP部、SP部に対し、それぞれQAM復調を行うため、両帯域間の干渉や同一チャンネルで伝送されるNTSC信号からの妨害をさらに低減することが可能で、より高精度のデータ復調が可能となる。また、局部発振器26の発振周波数を制御してQAM復調を行う

ため、高精度な高精細テレビジョン信号の復調が可能となる。

【0033】図9は本発明の第8の実施例を示す受信装置のブロック図、図10は第8の実施例を補足する信号帯域図である。図9において、図2に示した実施例と同様の動作を行う部分には、図2と同一の番号を付し説明を略す。同図において、52は高精細テレビジョン信号用復調器である。

【0034】本実施例は、図10に示すベースバンド信号帯域を有する高精細テレビジョン信号と、NTSC信号を受信することを特徴とする。図10には図7と同様高精細テレビジョン信号の周波数スペクトルに、比較のためNTSC信号の映像及び音声搬送波(f_v 、 f_s)と色副搬送波(f_c)を示した。同図は6MHzの信号帯域に圧縮する高精細テレビジョン信号の他の形式として4値の残留側帯振幅変調(VSB)を用いた信号帯域図である。本実施例は二重周波数変換された高精細テレビジョン信号の第2IF信号をSAWフィルタで構成した高精細テレビジョン信号用のIFフィルタ15で選択通過させ、第2のIF増幅器16で増幅した後、NTSC信号のIF信号と同様に、AM復調器34に入力し、復調する。NTSC信号を復調した場合にはAM復調器34から復調信号を出力するが、高精細テレビジョン信号を復調した場合にはさらに高精細テレビジョン信号用復調器52に入力し、復調を行う。なお、同一チャネルで伝送されるNTSC信号からの妨害を低減するため、AM復調器34の中には高精細テレビジョン信号受信時に動作する上記NTSC信号の搬送波、副搬送波を除去するノッチフィルタを設けている。また、入力フィルタ6に、1チャネル分の帯域幅を有し、局部発振器26の発振周波数に追従してその通過帯域の中心周波数を可変するバンドパスフィルタを設け、希望受信信号に比べて強電界の妨害信号が入力した場合にも、妨害の発生を低減している。

【0035】本実施例では、第2の実施例で述べた効果に加え、高精細テレビジョン信号もAM変調されているので、高精細信号の復調の一部をNTSC信号の復調器を用いて行うことができ、またAGC電圧やAFC電圧の制御も共通に行うことができ、受信装置の回路構成が簡略化され、回路規模を縮小することが可能となる。また、本実施例では高精細テレビジョン信号用IFフィルタ15とNTSC信号用IFフィルタ24を別個に設けたが、高精細テレビジョン信号とNTSC信号の残留側帯幅やロールオフ特性が類似している場合には両者を共有することができ、さらに回路規模が縮小される。

【0036】図11は本発明の第9の実施例を示す受信装置のブロック図、図12は第9の実施例を補足する信号帯域図である。同図において、図2及び図8に示した実施例と同様の動作を行う部分には、図2及び図8と同一の番号を付し説明を略す。同図において、53は高精

細テレビジョン信号用データ復調器である。

【0037】本実施例は、図12に示すベースバンド信号帯域を有する高精細テレビジョン信号と、NTSC信号を受信することを特徴とする。図12には図7と同様高精細テレビジョン信号の周波数スペクトルに、比較のためNTSC信号の映像及び音声搬送波(f_v 、 f_s)と色副搬送波(f_c)を示した。同図は6MHzの信号帯域に圧縮する高精細テレビジョン信号の他の形式として16値あるいは32値のQAM変調を用いた信号帯域図である。本実施例は二重周波数変換された高精細テレビジョン信号の第2IF信号をSAWフィルタで構成した高精細テレビジョン信号用のIFフィルタ15で選択通過させ、第2のIF増幅器16で増幅した後、第1のQAM検波器70で、第5の発振器76の発振信号を90度移相器72で移相して互いに90度の位相差を有する2信号を用いて検波する。この際、AFC電圧発生回路78で局部発振器26の発振周波数を制御し、第1及び第2のキャリア及びクロック再生回路74、75でのキャリア及びクロック信号再生を最良状態となるように周波数制御を行う。検波された信号はデータ復調器53へ入力し、復調する。なお、ここでは局部発振器26の発振周波数を制御したが、第2の局部発振器28の発振周波数を制御する構成や第5の発振器76の発振周波数を制御する構成でもよい。また、同一チャネルで伝送されるNTSC信号からの妨害を低減するため、QAM検波器70には上記NTSC信号の搬送波、副搬送波を除去するためノッチフィルタを設けている。

【0038】本実施例では、第2の実施例で述べた効果に加え、局部発振器26の発振周波数を制御してQAM復調を行うため、高精度な高精細テレビジョン信号の復調が可能となる。

【0039】なお、これまで述べた実施例は、NTSC信号と高精細テレビジョン信号を信号入力端子1から入力し、分配器5で分配する構成としているが、入力端子を2個設けて、それぞれの信号処理部に入力する構成としても同様な効果が得られる。

【0040】また、これまでの実施例は、NTSC信号と高精細テレビジョン信号を受信する受信装置として、主にTV、VTR機器での使用を述べたが、前記受信装置はデジタル通信等の通信分野へ応用しても同様な効果が得られる。

【0041】

【発明の効果】本発明によれば、NTSC信号と6MHzの帯域に圧縮されて伝送する高精細テレビジョン信号を受信可能な受信装置を提供できる。また、選局回路、局部発振器、第1ミキサをNTSC信号と高精細テレビジョン信号で共用し、IFフィルタと復調器をNTSC信号と高精細テレビジョン信号用に個別に設けることで、回路規模を低減したNTSC信号、高精細テレビジョン信号を受信する受信装置が構成できる。

【図面の簡単な説明】

【図1】本発明の第1の実施例を示すブロック図である。

【図2】第2の実施例を示すブロック図である。

【図3】第3の実施例を示すブロック図である。

【図4】第4の実施例を示すブロック図である。

【図5】第5の実施例を示すブロック図である。

【図6】第6の実施例を示すブロック図である。

【図7】第6の実施例を補足する信号帯域図である。

【図8】第7の実施例を示すブロック図である。

【図9】第8の実施例を示すブロック図である。

【図10】第8の実施例を補足する信号帯域図である。

【図11】第9の実施例を示すブロック図である。

【図12】第9の実施例を補足する信号帯域図である。

【図13】従来例を示すブロック図である。

【符号の説明】

1…信号入力端子、
2…選局信号入力端子、
3…高精細テレビジョン信号出力端子、
4…NTSC信号出力端子、
5…分配器、
7、9、18、20…可変減衰器、
8、19…第1、第2のRF増幅器、
10…第1ミキサ、
11…第1IFフィルタ、
12…第1IF増幅器、
13…第2ミキサ、
14…第1のIF増幅器、
15、60、61…高精細テレビジョン信号用IFフィ

ルタ、

16…第2のIF増幅器、

17、21…可変同調回路、

22…第3ミキサ、

23…第3のIF増幅器、

24…NTSC信号用IFフィルタ、

25…第4のIF増幅器、

26…第3の局部発振器、

27…高精細テレビジョン信号用第1の局部発振器、

28…第2の局部発振器、

29、30、36、41、64、65、…ローパスフィルタ、

31、32…PLL回路、

33、50、51、52、53…高精細テレビジョン信号用復調器、

34…NTSC信号用復調器、

35…高精細テレビジョン信号用レベル検出器、

37…AGC電圧増幅器、

39…第4ミキサ、

40…第4の局部発振器、

42…分周器、

62…第5のIF増幅器、

63…第5ミキサ、

66、67…ベースバンド信号用増幅器、

70、71…QAM検波器、

72、73…90度移相器、

74、75…キャリア及びクロック再生回路、

76、77…基準発振器、

78…AFC電圧発生器。

【図7】

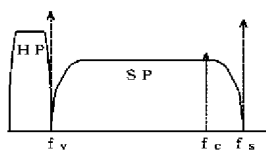


図 7

【図10】

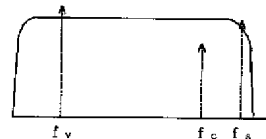


図 10

【図12】

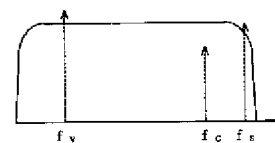


図 12

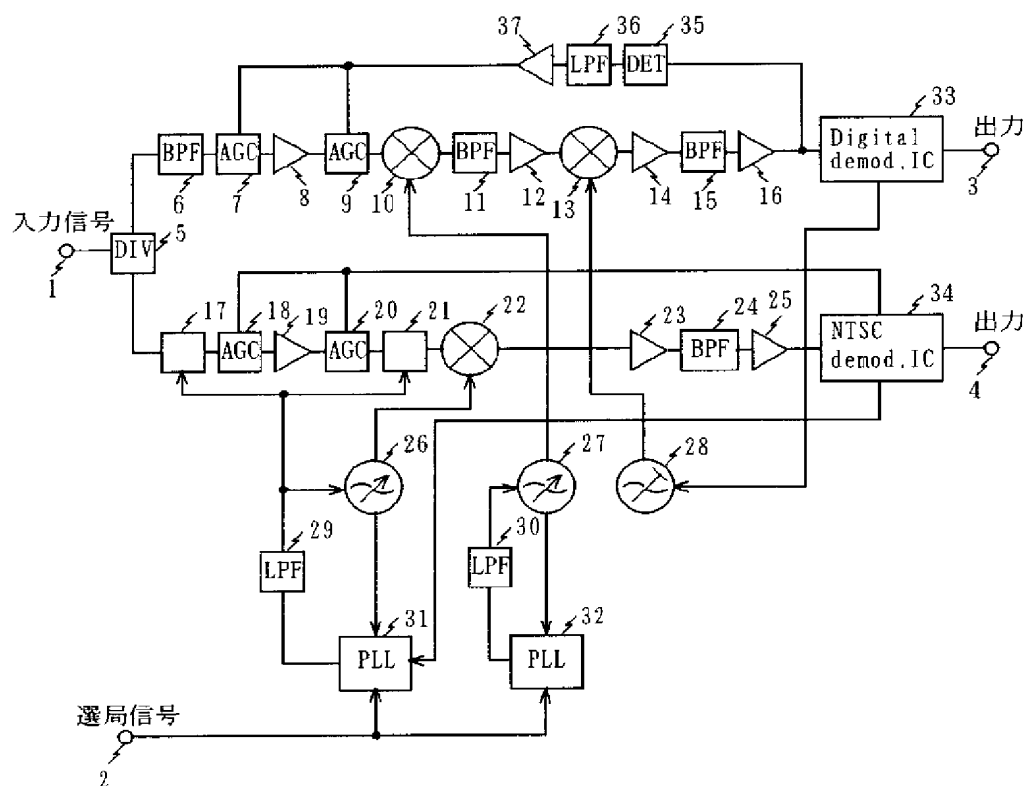
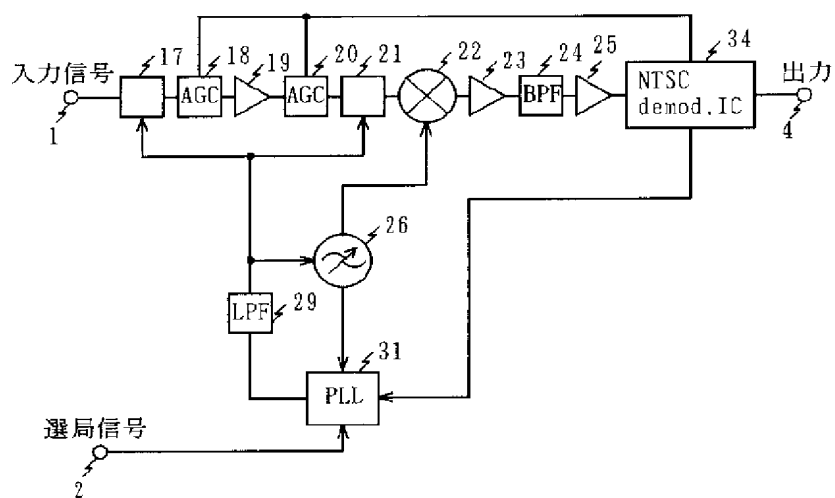
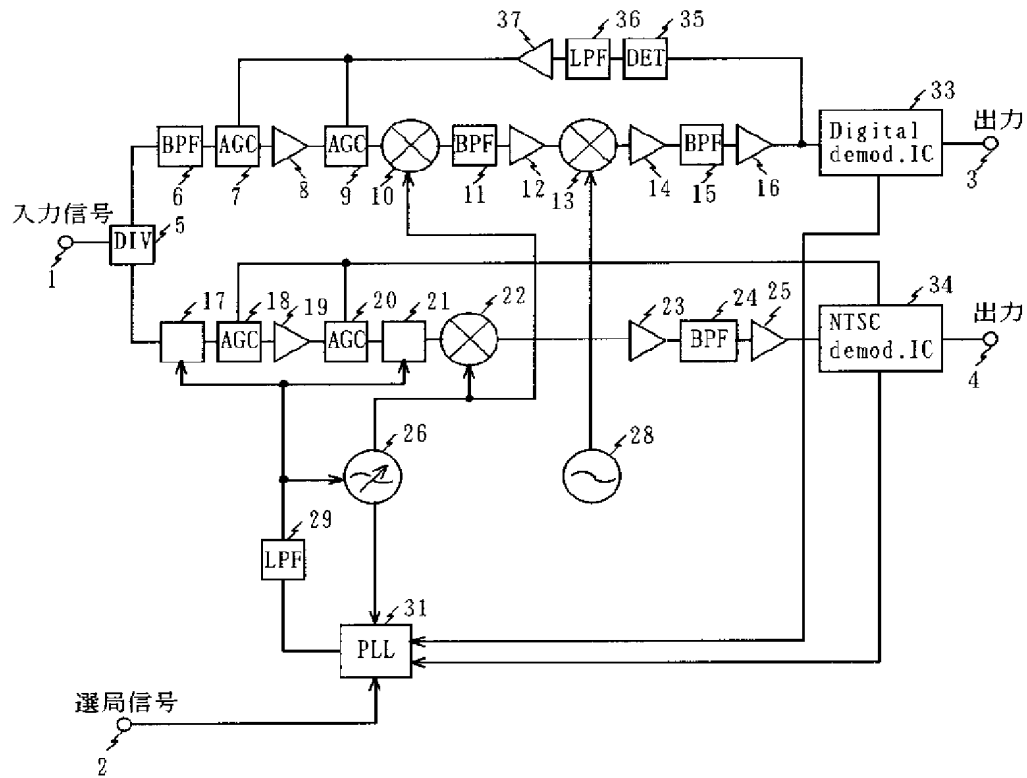


图 13



【図2】

図 2



【例 3】

图 3

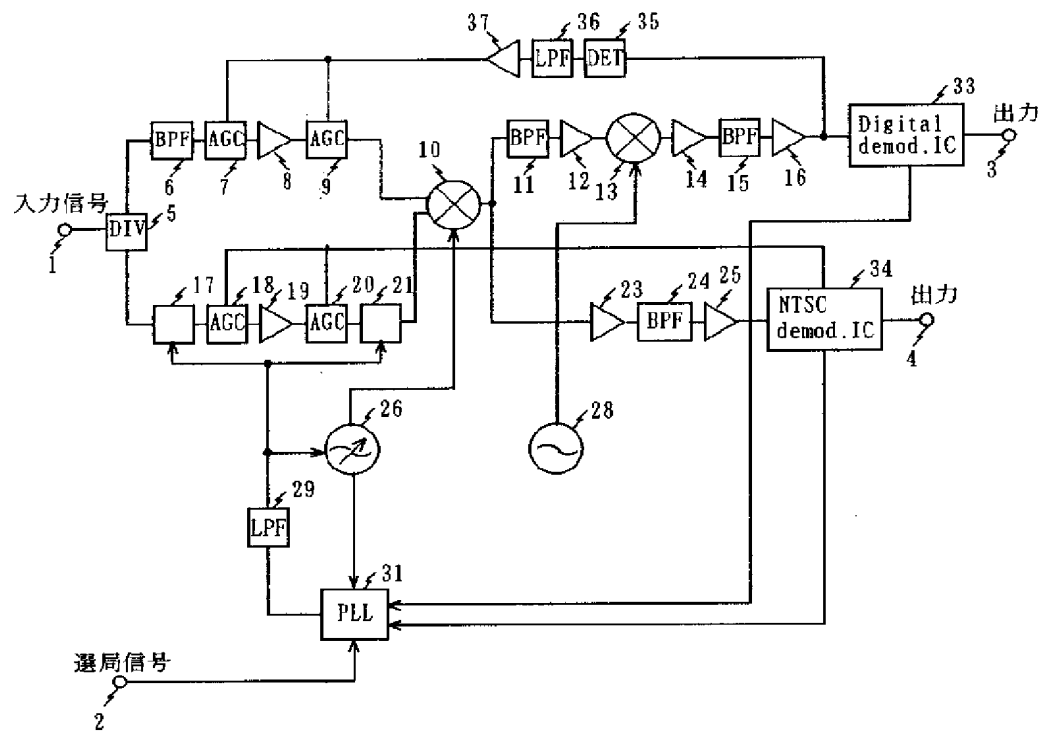
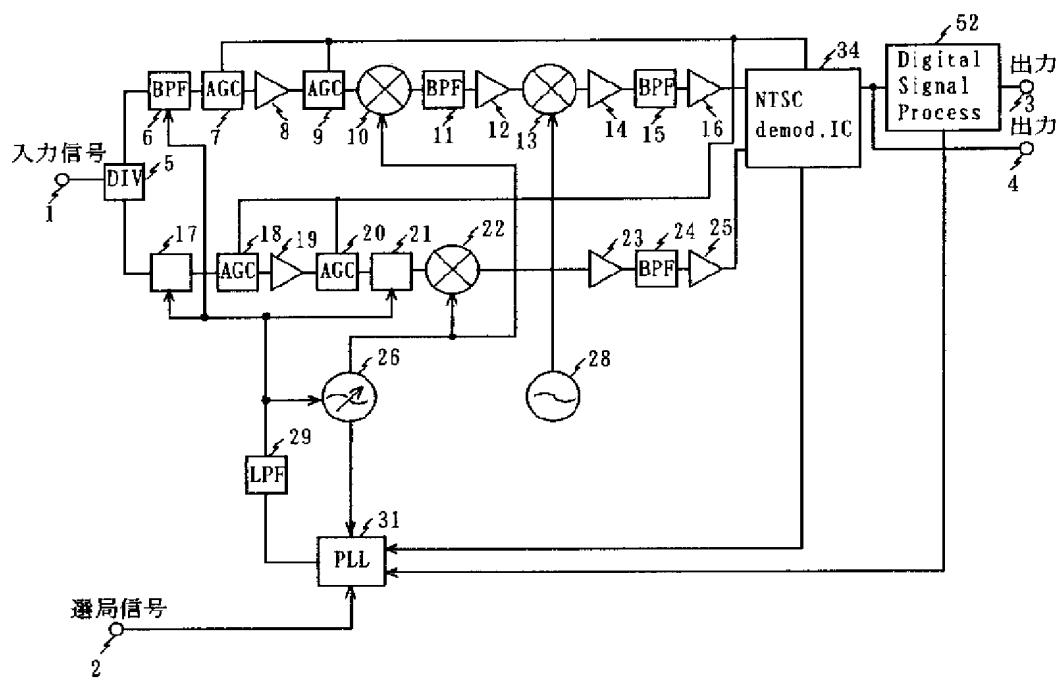


图 4



图 9



【図5】

図 5

